

## **Title: Mystery Location**

### **Brief Overview:**

Students will learn about the seasons and how the tilt of the Earth affects the amount of daylight a location on the Earth will receive on any day. The students will use sunrise and sunset information to graph the amount of daylight for Washington, DC on a periodic basis. Using their graphs, the students will make observations about the amount of daylight Washington, DC receives during each season of the year.

After understanding how to construct the Washington, DC daylight hours graph, groups of students are given similar data for an unknown location. The students construct a graph of daylight hours for their unknown location. The students analyze the graphs to obtain clues about the location (i.e., Northern or Southern Hemisphere, near the Equator, etc.) Then the teacher provides the list of locations with their latitude/longitudes. The students compare graphs and clues to determine the possible locations that match their graphs.

### **NCTM 2000 Principles for School Mathematics:**

- **Equity:** *Excellence in mathematics education requires equity - high expectations and strong support for all students.*
- **Curriculum:** *A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.*
- **Teaching:** *Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.*
- **Learning:** *Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.*
- **Assessment:** *Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.*
- **Technology:** *Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.*

### **Links to NCTM 2000 Standards:**

- **Content Standards**

#### **Number and Operations**

- *Understand numbers, ways of representing numbers, relationships among numbers, and number systems; recognize equivalent representations for the same number and generate them by decomposing and composing numbers; develop understanding of fractions as*

*parts of unit wholes, as parts of a collection, as locations on number lines, and as divisions of whole numbers; use models, benchmarks, and equivalent forms to judge the size of fractions; and recognize and generate equivalent forms of commonly used fractions, decimals, and percents.*

- *Compute fluently and make reasonable estimates; develop and use strategies to estimate computations involving fractions and decimals in situations relevant to students' experience; and select appropriate methods and tools for computing with whole numbers from among mental computation, estimate, calculators, and paper and pencil according to the context and nature of the computation and use the selected method or tools.*

### **Algebra**

- *Understand patterns, relations, and functions; and represent and analyze patterns and functions, using words, tables, and graphs.*
- *Use mathematical models to represent and understand quantitative relationships; and model problem situations with objects and use presentations such as graphs, tables, and equations to draw conclusions.*
- *Analyze change in various contexts; investigate how a change in one variable relates to a change in a second variable; and identify and describe situations with constant or varying rate of change and compare them.*

### **Data Analysis and Probability**

- *Formulate questions that can be addressed with data and collect, organize and display relevant data to answer them; collect data using observations, surveys, and experiments; and represents data using tables and graphs such as: line plots, bar graphs, and line graphs.*
- *Select and use appropriate statistical methods to analyze data; describe the shape and important features of a set of data and compare related data sets, with an emphasis on how data are distributed; use measure of center, focusing on the median and understand what each does and does not indicate about the data set; and compare different representations of the same data and evaluate how well each representation shows important aspects of the data.*
- *Develop and evaluate inferences and predictions that are based on data; and propose and justify conclusions and predictions that are based on data and design studies to further investigate the conclusions or predictions.*

### **Process Standards**

### **Problem Solving**

- *Instructional programs from pre-kindergarten through grade 12 should enable all students to build new mathematical knowledge through problem solving; solve problems that arise in mathematics and in other contexts; apply and adapt a variety of appropriate strategies to solve problems; and monitor and reflect on the process of mathematical problem solving.*

### **Reasoning and Proof**

- *Instructional programs from pre-kindergarten through grade 12 should enable all students to recognize reasoning and proof as fundamental aspects of mathematics; make and investigate mathematical conjectures; develop and evaluate mathematical arguments and proofs; and select and use various types of reasoning and methods of proof.*

### **Communication**

- *Instructional programs from pre-kindergarten through grade 12 should enable all students to organize and consolidate their mathematical thinking through communication; communicate their mathematical thinking coherently and clearly to peers, teachers, and others; analyze and evaluate the mathematical thinking and strategies of others; and the language of mathematics to express mathematical ideas precisely.*

### **Connections**

- *Instructional programs from pre-kindergarten through grade 12 should enable all students to recognize and use connections among mathematical ideas; understand how mathematical ideas interconnect and build on one another to produce a coherent whole; and recognize and apply mathematics in context outside of mathematics.*

### **Representation**

- *Instructional programs from pre-kindergarten through grade 12 should enable all students to create and use representations to organize, record, and communicate mathematical ideas; select, apply, and translate among mathematical representations to solve problems; and use representations to model and interpret physical, social, and mathematical phenomena.*

## **Links to National Science Education Standards:**

- **Unifying Concepts and Processes**

The standards in this bulleted list are in the only acceptable order.

- **Earth and Space Science**

### **Properties of Earth Materials**

- *The sun, moon, stars, clouds, birds, and airplanes all have properties, locations, and movements that can be observed and described.*

### **Changes in the Earth and Sky**

- *Objects in the sky have patterns of movement. The sun, for example, appears to move across the sky in the same way every day, but its path changes slowly over the seasons. The moon moves across the sky on a daily basis much like the sun. The observable shape of the moon changes from day to day in a cycle that lasts about a month.*

## **Grade/Level:**

Grades 4-5

**Duration/Length:**

This unit contains five lesson plans, which last about 45 minutes each.

**Prerequisite Knowledge:**

Students should have working knowledge of the following skills:

- Creating line graphs
- Telling time to the nearest minute

**Student Outcomes:**

Students will:

- Calculate the amount of hours of daylight using sunrise / sunset data. In doing so, the students will learn how to calculate time durations.
- Create line graphs of daylight hour information.
- Analyze line graphs to look for trends (when the line is going up, when it is going down.)
- Represent two sets of data on the same line graph to compare the data.
- Use the globe to find latitude/longitude locations.
- Problems solve to determine their mystery locations using the line graphs and understanding of Northern/Southern hemisphere seasons.
- Write a paragraph discussing how he/she determined the identity of the mystery location.

**Materials/Resources/Printed Materials:**

- Copies of Student Resource Sheets for each student
- A copy of Teacher Resource Sheets
- Globe (use additional globes for Day 5, if possible)
- A copy of Teacher Resource Sheet #3 cut into 4 pieces, or use cards labeled “December”, “March”, “June”, and “September, with tape on back of cards
- A light that can be placed in the center of a circle of chairs
- Sunshine Makes the Seasons (Let’s-Read-and-Find-Out-Science) by Giulio Maestro, ISBN: 0064450198; Published by Harper Trophy, 1986 (Optional)

**Development/Procedures:****Day 1**

If available, read the book Sunshine Makes the Seasons to the class to introduce the seasons of the year and tilt of the Earth. If the book is not available, initiate a discussion with the students about the times they go to bed and if the sun is still up. *“Whether the sun is still up at 8:30pm depends on the time of the year. In winter, we have less daylight and the sunsets around 5:30pm. While in the summer we have more daylight, and the*

*sun doesn't set until 9pm! Does anyone know why this happens?"*

*"We're going to act out what happens with the Earth that makes our seasons. We'll use a globe to represent the Earth, and this light to represent the sun. As you already know, the Earth travels around the sun. It takes exactly one year to make one complete orbit around the sun.*

*Take a look at this paper (Distribute Student Resource Sheet #1, Earth's Orbit Around the Sun, to the students). See how the Earth's orbit is in the shape of an oval? We'll set up our chairs in the shape of an oval, and we'll put these cards on the chairs to represent the location of the Earth in December, March, June, and September."* Arrange chairs, light source, and tape cards to the four seats to represent the orbit of the Earth around the sun. (Use Teacher Resource Sheet #3 for Month labels.)

Have students sit in the chairs. Hold up the globe and show how the Earth is tilted, and not straight up and down. Also slowly spin the globe one time to show that the Earth rotates on its axis, which is what makes one day.

Hand the globe to the student sitting in the chair labeled "June."

Turn on the light (to represent the sun) and turn off the overhead lights.

Have the student slowly spin the globe on its axis and have the other students watch to see where light touches the globe. Have the students pass the globe from student to student and have each student seated in the oval slowly spin the globe to represent rotation of the Earth. Remind the students that moving the globe from student to student represents moving the Earth along its orbit around the sun.

Show and explain how the tilt of the Earth affects the amount of daylight we receive during the year. Also, explain how Northern hemisphere and Southern hemisphere have opposite seasons.

## **Day 2**

Remind the students of the demonstration with the globe they did the previous day.

*"Today we're going to see how the time of the year affects the amount of daylight we get each day."*

Introduce how to find the number of hours/minutes of daylight using sunrise and sunset information. For example, on September 4, 2002 the sunrise time for Washington, DC is 5:40am, and the sunset time is 6:34pm. To figure the amount of hours of daylight, have the students use their fingers and count together as a group. Say: *"We'll start with 5:40am. Put that number in your head, and now we'll count how many hours there are until 6:34pm. 6:40, 7:40, 8:40, 9:40, 10:40, 11:40, 12:40, 1:40, 2:40, 3:40, 4:40, and 5:40pm – that's 12 hours. Now we need to figure out how many minutes there are from 5:40pm until 6:34pm. First figure out how many minutes there are until 6pm. We need*

*20 minutes to get to 6:00pm. Now, how many more minutes do we need to get to 6:34pm? Right. 34 minutes. So, we add 20 + 34 to get 54 minutes. We figured out that the amount of daylight we had on September 4<sup>th</sup> was 12 hours and 54 minutes."*

Continue practicing with other examples if students need more practice.

When you feel the students are ready to calculate daylight information, pair up the students (or put them into groups of 3.) Provide each student with sunrise and sunset information for Washington, DC (Student Resource Sheet #2.) Have the students work together to calculate the daylight hours/minutes for the data points for Washington, DC. An answer key is provided on Teacher Resource Sheet 4.

Collect the work the teams have produced, so that it can be used the next day.

### **Day 3**

Return worksheets to the students from the previous day. If necessary, allow more time to complete calculations.

As a class, review the hours/minutes of daylight calculations for each of the 13 data points for Washington, DC. If there are mistakes, have them write the correct answers on their papers.

Now have the students create individual line graphs using the Washington, DC data. Give each student the Student Resource Sheet #3 page, to graph the daylight hours for Washington, DC. (If desired, use a transparency of Student Resource #3, and show the students how to plot the first point, and how to label the graph appropriately.) Have students plot all 13 points for Washington, DC on their graphs. (Student Resource Sheet #4 may be used instead, if you do not wish to provide a scale or bar labels for the students.)

If time allows, discuss the shape of the graph and show how the line goes up during the summer months, and goes down during the winter months. Remind the students that Washington, DC is in the Northern hemisphere, and that's why the graph is shaped as it is. Ask the students how they think the graph might look if we graphed a location in the Southern hemisphere.

### **Day 4**

*"Now that we understand how the movement of the Earth around the sun and our location on the Earth affect the amount of daylight we receive, I will be giving you some mystery data to calculate and plot. From that data, you'll try to come up with clues about where in the world your mystery location might be!"*

Pair the students or have them work in groups of 3. Give each team a data sheet for a different mystery location (Student Resource Sheets #5). Eight mystery locations are

provided. Their first task is to calculate the amount of daylight hours and minutes for each of the 13 points. The members of the team need to work together and agree on their answers. An answer key is provided on Teacher Resource Sheet 5.

Next, each team will graph their daylight data points on top of their Washington, DC graphs (which they created yesterday.) Make sure the students add a key to their graphs and use a different symbol for the mystery data they are plotting. (Refer to Teacher Resource Sheet #1 as an example.)

### **Day 5**

*“Today we’ll analyze the graphs you’ve created to look for clues. Later I’ll provide more information to help you.”*

Distribute copies of Student Resource Sheet #6 to each student. Have student teams spend a few minutes studying the graphs and comparing the mystery data with the Washington, DC data. If necessary, ask leading questions to help the students hypothesize if their mystery location is in the Northern or Southern hemisphere. Have students write down their clues on their Student Resource Sheet #6 pages.

Write on the board (or use overhead) the list of Latitude/Longitudes for the mystery locations. Also write the list of location names (in random order). Information can be found on Teacher Resource Sheet #2.

Show the students how to find latitude/longitude locations on a globe. Show the students where the prime meridian is, and explain that longitudes are measured East and West of that point. Also, show the Equator and explain that latitudes are measured North and South of the Equator. Show the latitude/longitude information for Washington, DC and explain how to find **N38 53’, W 77 02’** on the globe.

If possible, have 1 globe per team, or have groups share globes. Assign 2 different mystery latitude/longitude locations to each team for the students to find on the globe. As a class, match up the location names with the latitude/longitudes on the board.

Have teams look at the mystery location names and their clues to see if they can make an educated guess as to their mystery locations. Have student teams write their guesses on their Student Resource Sheet #6 pages.

Hang up each team’s graph on the board (near the location names and latitude / longitude information.) Have each team tell the class their guesses, and as a class work to match the location names with the graphs.

If time allows (or for homework) have students write a paragraph explaining how they figured out what their mystery locations were.

### **Performance Assessment:**

The teacher will make observations throughout the unit to assess:

1. If the students understand how to calculate hours/minutes of daylight given sunrise/sunset information (elapsed time.)
2. If the students work together cooperatively on their teams.
3. If the students understand how to find latitude/longitude locations on a globe.

The teacher will evaluate the graphs created by the students to see if the students adequately represented two sets of data on the same line graph for comparison purposes.

The teacher will evaluate the clues and final paragraph written by each student to see if the students were able to notice trends in the data, and what problem solving methods were used to determine their mystery locations.

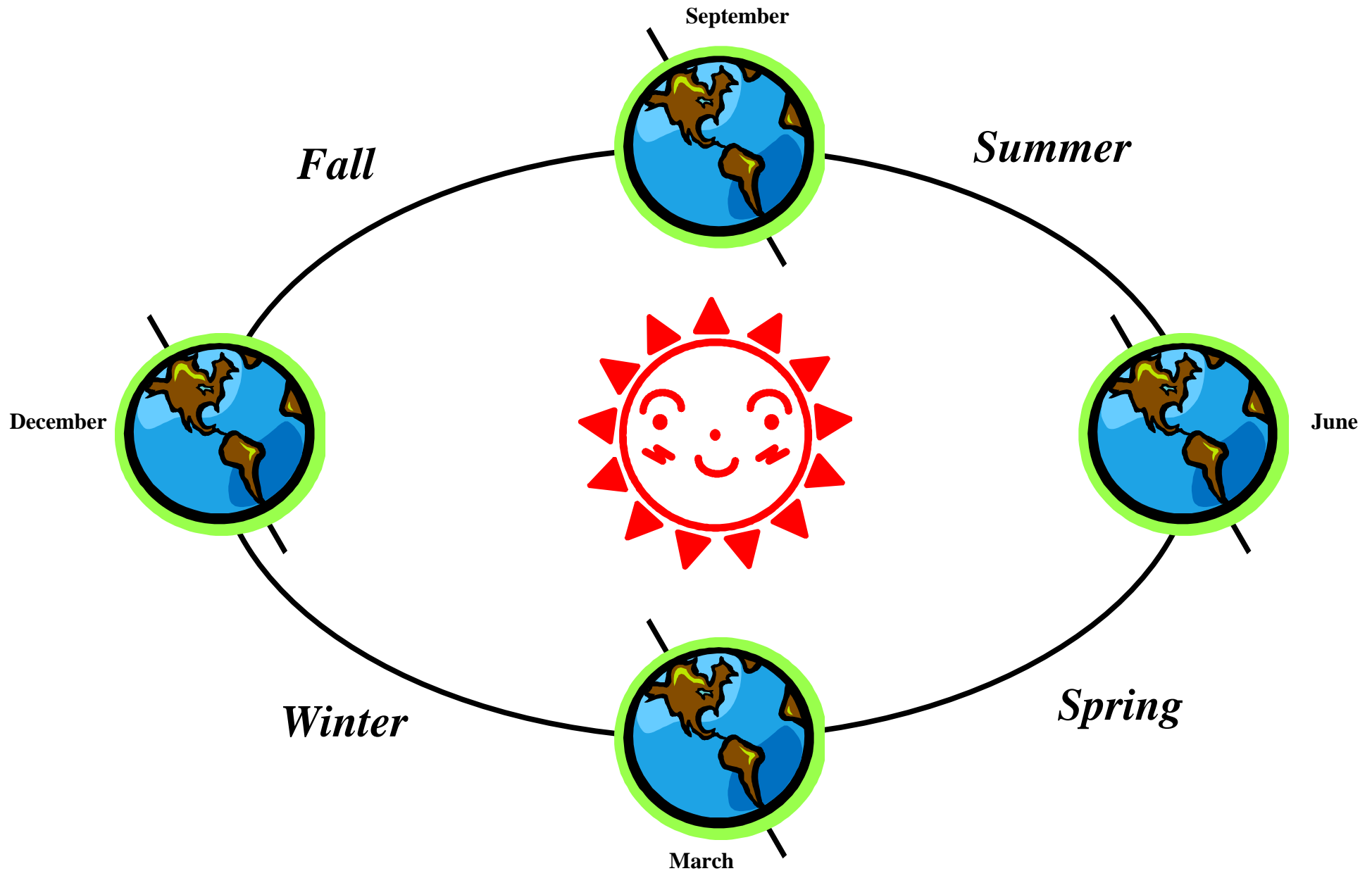
### **Extension/Follow Up:**

1. Using data for the mystery locations and Washington, DC, ask the students how they can use their data to estimate the total amount of daylight per year each location receives. Have the students perform their calculations and then graph comparisons of total daylight hours versus Latitude information. Have students write why they think there are differences.
2. Have students graph multiple mystery locations on the same graph using different symbols to compare the different data on the same graph. See Teacher Resource Sheet #16 as an example.
3. Another extension would be to find average temperature data for each location to see if there is a correlation between temperature and the amount of daylight a location receives.
4. Data used in this lesson can be found on Teacher Resource Sheets #6-15. Those sheets contain weekly data, rather than monthly data. An extension would be to have the students graph weekly data instead of monthly data. The sunrise and sunset information contained in this unit were obtained from:  
<http://mach.usno.navy.mil/> , The U.S. Naval Observatory Astronomical Applications Department, Washington, DC 20392-5420.

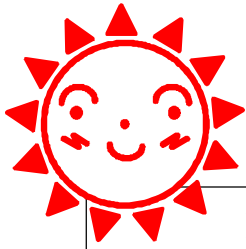
### **Authors:**

Catherine A. Scarbrough  
Seneca Academy, Darnestown, Maryland  
Montgomery County, Maryland

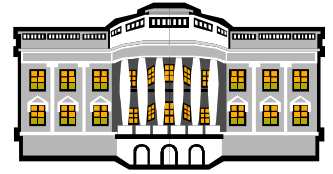
# Earth's Orbit Around the Sun



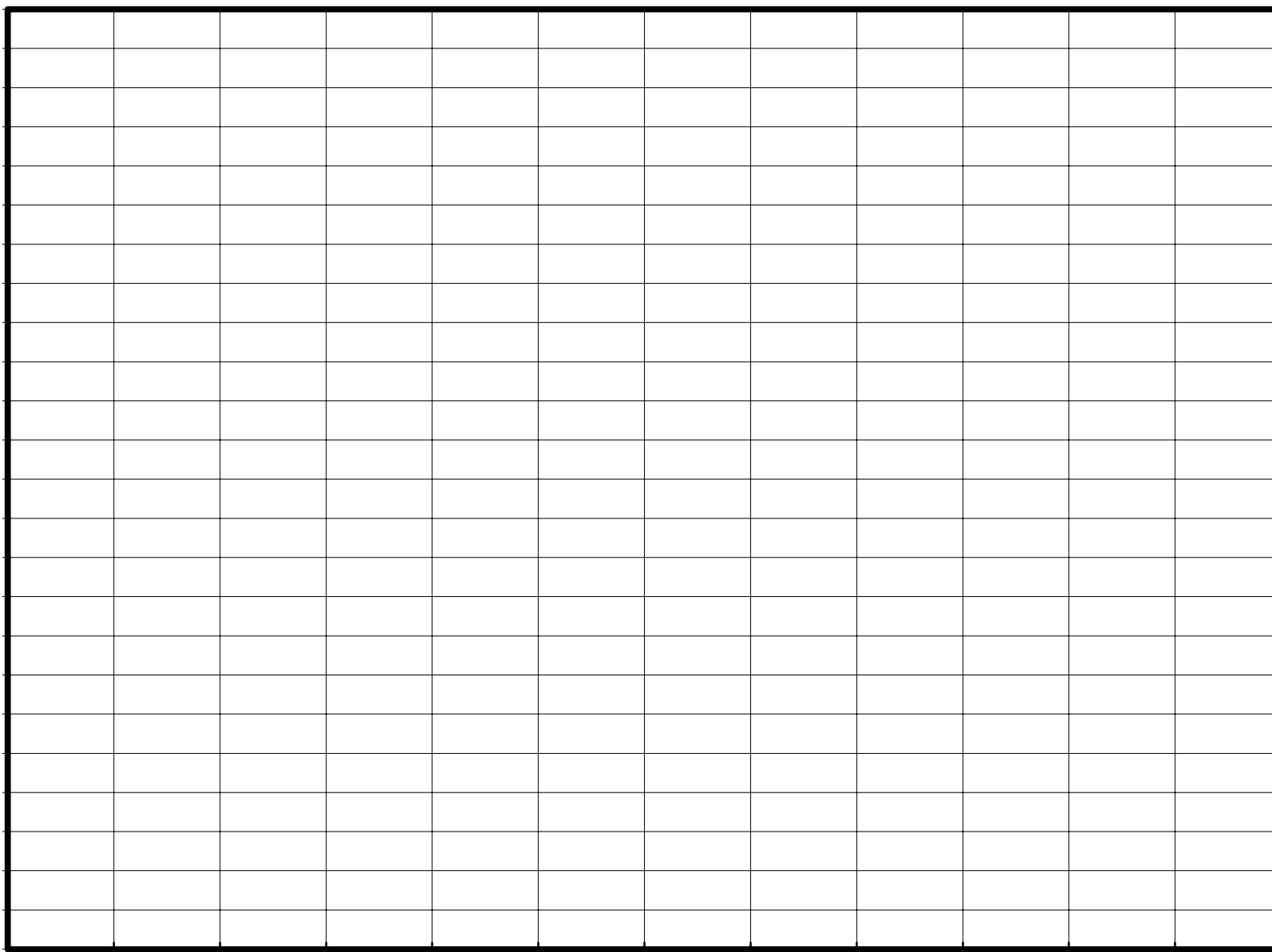
*Seasons are for Northern Hemisphere == all parts of the Earth, north of the Equator.*

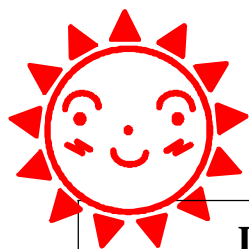


## Sunrise and Sunset Data for Washington, DC



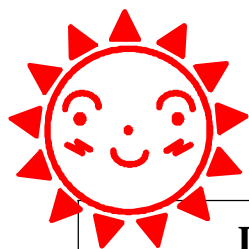
Date	Sunrise	Sunset	Daylight hours and minutes	
January 16, 2002	7:25am	5:11pm	hr	min
February 13, 2002	7:02am	5:32pm	hr	min
March 13, 2002	6:23am	6:13pm	hr	min
April 10, 2002	5:39am	6:40pm	hr	min
May 8, 2002	5:03am	7:07pm	hr	min
June 5, 2002	4:43am	7:30pm	hr	min
July 3, 2002	4:47am	7:37pm	hr	min
July 31, 2002	5:08am	7:20pm	hr	min
August 28, 2002	5:33am	6:45pm	hr	min
September 25, 2002	5:58am	6:00pm	hr	min
October 23, 2002	6:26am	5:19pm	hr	min
November 20, 2002	6:56am	4:51pm	hr	min
December 18, 2002	7:21am	4:48pm	hr	min





# Sunrise and Sunset Data for **Mystery Location #1**

Date	Sunrise	Sunset	Daylight hours and minutes			
January 16, 2002	----	-----	0	hr	0	min
February 13, 2002	----	-----	0	hr	0	min
March 13, 2002	7:40am	6:24pm		hr		min
April 10, 2002	3:39am	10:13pm		hr		min
May 8, 2002	0:00am	0:00am	24	hr	0	min
June 5, 2002	0:00am	0:00am	24	hr	0	min
July 3, 2002	0:00am	0:00am	24	hr	0	min
July 31, 2002	0:00am	0:00am	24	hr	0	min
August 28, 2002	2:33am	10:57pm		hr		min
September 25, 2002	6:46am	6:34pm		hr		min
October 23, 2002	10:57am	2:11pm		hr		min
November 20, 2002	----	-----	0	hr	0	min
December 18, 2002	----	-----	0	hr	0	min



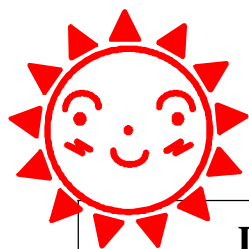
## Sunrise and Sunset Data for **Mystery Location #2**

Date	Sunrise	Sunset	Daylight hours and minutes	
January 16, 2002	10:55am	5:25pm	hr	min
February 13, 2002	9:47am	6:41pm	hr	min
March 13, 2002	8:23am	7:57pm	hr	min
April 10, 2002	6:54am	9:09pm	hr	min
May 8, 2002	5:31am	10:23pm	hr	min
June 5, 2002	4:30am	11:28pm	hr	min
July 3, 2002	4:30am	11:37pm	hr	min
July 31, 2002	5:29am	10:41pm	hr	min
August 28, 2002	6:41am	9:18pm	hr	min
September 25, 2002	7:51am	7:50pm	hr	min
October 23, 2002	9:03am	6:23pm	hr	min
November 20, 2002	10:19am	5:11pm	hr	min
December 18, 2002	11:12am	4:40pm	hr	min



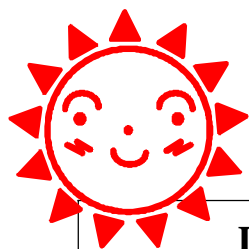
## Sunrise and Sunset Data for **Mystery Location #3**

Date	Sunrise	Sunset	Daylight hours and minutes	
January 16, 2002	5:49am	7:55pm	hr	min
February 13, 2002	6:17am	7:37pm	hr	min
March 13, 2002	6:41am	7:03pm	hr	min
April 10, 2002	7:01am	6:26pm	hr	min
May 8, 2002	7:22am	5:56pm	hr	min
June 5, 2002	7:40am	5:42pm	hr	min
July 3, 2002	7:47am	5:47pm	hr	min
July 31, 2002	7:35am	6:03pm	hr	min
August 28, 2002	7:06am	6:22pm	hr	min
September 25, 2002	6:28am	6:41pm	hr	min
October 23, 2002	5:52am	7:02pm	hr	min
November 20, 2002	5:29am	7:28pm	hr	min
December 18, 2002	5:28am	7:51pm	hr	min



## Sunrise and Sunset Data for **Mystery Location #4**

Date	Sunrise	Sunset	Daylight hours and minutes	
January 16, 2002	6:57am	7:03pm	hr	min
February 13, 2002	7:01am	7:08pm	hr	min
March 13, 2002	6:57am	7:03pm	hr	min
April 10, 2002	6:48am	6:55pm	hr	min
May 8, 2002	6:43am	6:51pm	hr	min
June 5, 2002	6:45am	6:53pm	hr	min
July 3, 2002	6:50am	6:59pm	hr	min
July 31, 2002	6:53am	7:01pm	hr	min
August 28, 2002	6:48am	6:55pm	hr	min
September 25, 2002	6:39am	6:45pm	hr	min
October 23, 2002	6:32am	6:38pm	hr	min
November 20, 2002	6:33am	6:39pm	hr	min
December 18, 2002	6:44am	6:50pm	hr	min



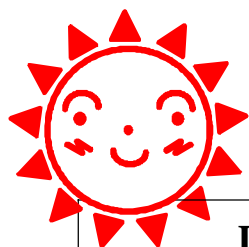
## Sunrise and Sunset Data for **Mystery Location #5**

Date	Sunrise	Sunset	Daylight hours and minutes	
January 16, 2002	7:13am	7:16pm	hr	min
February 13, 2002	7:17am	7:21pm	hr	min
March 13, 2002	7:11am	7:17pm	hr	min
April 10, 2002	7:02am	7:10pm	hr	min
May 8, 2002	6:56am	7:06pm	hr	min
June 5, 2002	6:57am	7:09pm	hr	min
July 3, 2002	7:03am	7:15pm	hr	min
July 31, 2002	7:06am	7:17pm	hr	min
August 28, 2002	7:02am	7:10pm	hr	min
September 25, 2002	6:53am	7:00pm	hr	min
October 23, 2002	6:47am	6:51pm	hr	min
November 20, 2002	6:48am	6:52pm	hr	min
December 18, 2002	6:59am	7:03pm	hr	min



## Sunrise and Sunset Data for **Mystery Location #6**

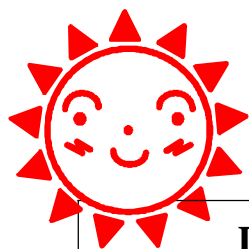
Date	Sunrise	Sunset	Daylight hours and minutes	
January 16, 2002	8:23am	6:09pm	hr	min
February 13, 2002	8:00am	6:41pm	hr	min
March 13, 2002	7:21am	7:11pm	hr	min
April 10, 2002	6:37am	7:38pm	hr	min
May 8, 2002	6:00am	8:05pm	hr	min
June 5, 2002	5:41am	8:28pm	hr	min
July 3, 2002	5:45am	8:35pm	hr	min
July 31, 2002	6:06am	8:19pm	hr	min
August 28, 2002	6:31am	7:43pm	hr	min
September 25, 2002	6:56am	6:58pm	hr	min
October 23, 2002	7:24am	6:16pm	hr	min
November 20, 2002	7:54am	5:49pm	hr	min
December 18, 2002	8:20am	5:46pm	hr	min



## Sunrise and Sunset Data for **Mystery Location #7**



Date	Sunrise	Sunset	Daylight hours and minutes			
January 16, 2002	----	-----	0	hr	0	min
February 13, 2002	11:22am	6:02pm		hr		min
March 13, 2002	8:59am	8:16pm		hr		min
April 10, 2002	6:38am	10:21pm		hr		min
May 8, 2002	3:32am	01:14am		hr		min
June 5, 2002	0:00am	0:00am	24	hr	0	min
July 3, 2002	0:00am	0:00am	24	hr	0	min
July 31, 2002	0:00am	0:00am	24	hr	0	min
August 28, 2002	6:16am	10:37pm		hr		min
September 25, 2002	8:20am	8:15pm		hr		min
October 23, 2002	10:27am	5:55pm		hr		min
November 20, 2002	----	-----	0	hr	0	min
December 18, 2002	----	-----	0	hr	0	min



## Sunrise and Sunset Data for **Mystery Location #8**

Date	Sunrise	Sunset	Daylight hours and minutes			
January 16, 2002	0:00am	0:00am	24	hr	0	min
February 13, 2002	3:33am	00:57am		hr		min
March 13, 2002	7:14am	9:02pm		hr		min
April 10, 2002	9:54am	6:06pm		hr		min
May 8, 2002	----	-----	0	hr	0	min
June 5, 2002	----	-----	0	hr	0	min
July 3, 2002	----	-----	0	hr	0	min
July 31, 2002	----	-----	0	hr	0	min
August 28, 2002	10:21am	5:43pm		hr		min
September 25, 2002	7:25am	8:22pm		hr		min
October 23, 2002	4:07am	11:29pm		hr		min
November 20, 2002	0:00am	0:00am	24	hr	0	min
December 18, 2002	0:00am	0:00am	24	hr	0	min

**Mystery Location # \_\_\_\_**

**Record your clues that you've discovered about your location.**

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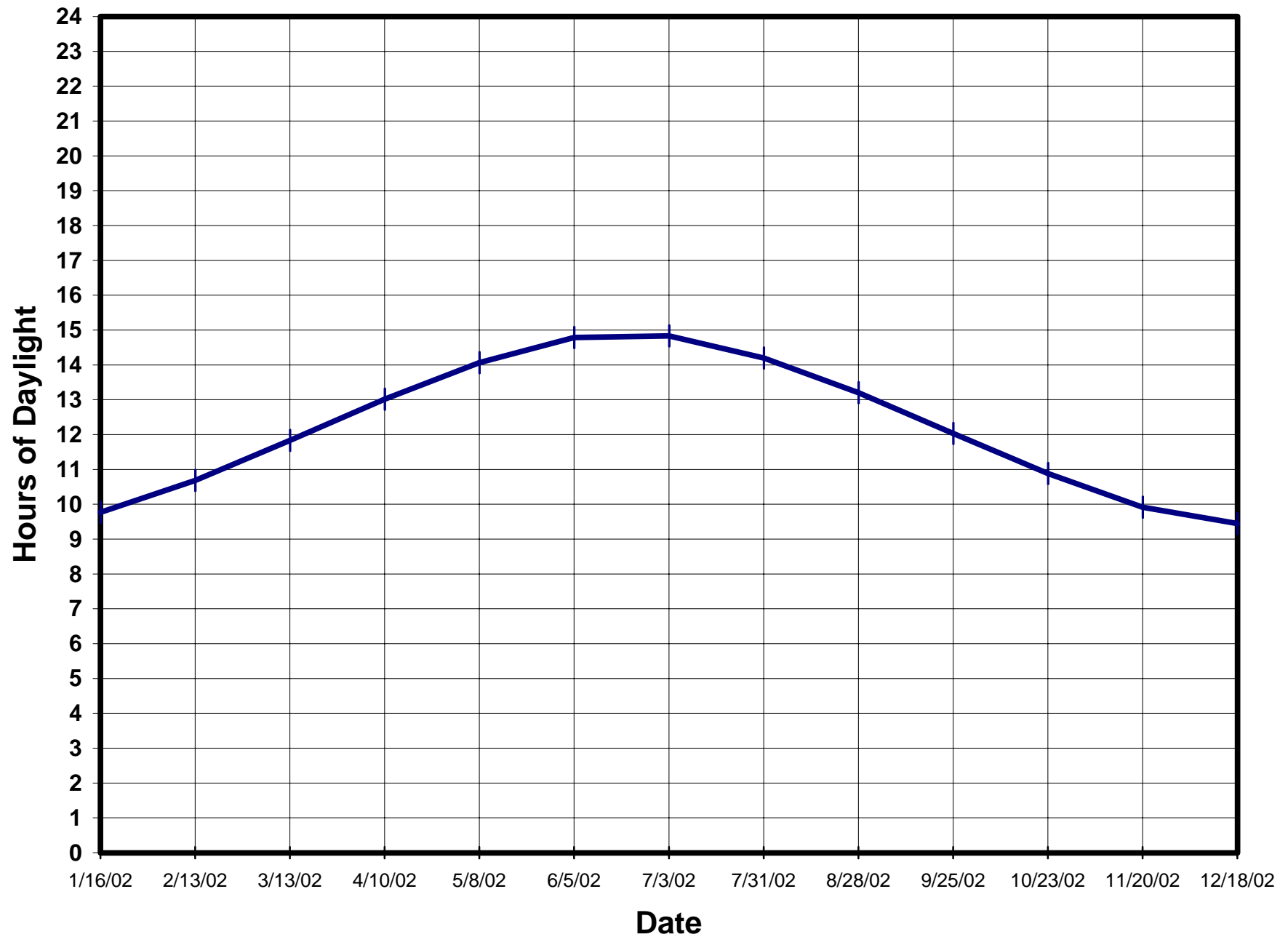
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**Record your educated guess about your Mystery Location.**

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# Hours of Daylight for Washington, DC



## Secret Mystery Locations

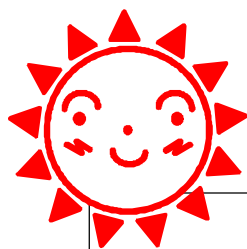
<b>Mystery Locations</b>	<b>City</b>	<b>Latitude, Longitude</b>
<b>#1</b>	Etah, Greenland	N78 19', W72 38'
<b>#2</b>	Anchorage, Alaska	N61 13', W149 54'
<b>#3</b>	Santiago, Chile	S22 27', W70 40'
<b>#4</b>	Kampala, Uganda	N00 19', E32 25'
<b>#5</b>	Singapore, Republic of Singapore	N01 16', E103 51'
<b>#6</b>	Anchorage, Maryland	N39 03', W76, 30'
<b>#7</b>	Barrow, Alaska	N71 17', W156 47'
<b>#8</b>	King Edward VII Land, Antarctica	S75 00', W150 00'

# June

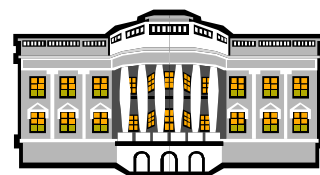
# September

# December

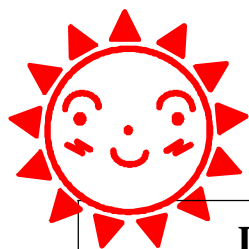
# March



## Sunrise and Sunset Data for Washington, DC



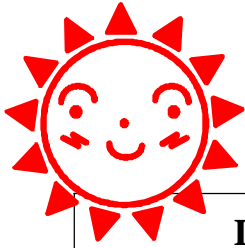
Date	Sunrise	Sunset	Daylight hours and minutes		
January 16, 2002	7:25am	5:11pm	<b>9</b>	hr	<b>46</b> min
February 13, 2002	7:02am	5:32pm	<b>10</b>	hr	<b>30</b> min
March 13, 2002	6:23am	6:13pm	<b>11</b>	hr	<b>50</b> min
April 10, 2002	5:39am	6:40pm	<b>13</b>	hr	<b>1</b> min
May 8, 2002	5:03am	7:07pm	<b>14</b>	hr	<b>4</b> min
June 5, 2002	4:43am	7:30pm	<b>14</b>	hr	<b>47</b> min
July 3, 2002	4:47am	7:37pm	<b>14</b>	hr	<b>50</b> min
July 31, 2002	5:08am	7:20pm	<b>14</b>	hr	<b>12</b> min
August 28, 2002	5:33am	6:45pm	<b>13</b>	hr	<b>12</b> min
September 25, 2002	5:58am	6:00pm	<b>12</b>	hr	<b>2</b> min
October 23, 2002	6:26am	5:19pm	<b>10</b>	hr	<b>53</b> min
November 20, 2002	6:56am	4:51pm	<b>9</b>	hr	<b>55</b> min
December 18, 2002	7:21am	4:48pm	<b>9</b>	hr	<b>27</b> min



# Sunrise and Sunset Data for **Mystery Location #1**



Date	Sunrise	Sunset	Daylight hours and minutes
January 16, 2002	----	-----	0 hr 0 min
February 13, 2002	----	-----	0 hr 0 min
March 13, 2002	7:40am	6:24pm	10 hr 44 min
April 10, 2002	3:39am	10:13pm	18 hr 34 min
May 8, 2002	0:00am	0:00am	24 hr 0 min
June 5, 2002	0:00am	0:00am	24 hr 0 min
July 3, 2002	0:00am	0:00am	24 hr 0 min
July 31, 2002	0:00am	0:00am	24 hr 0 min
August 28, 2002	2:33am	10:57pm	20 hr 24 min
September 25, 2002	6:46am	6:34pm	11 hr 48 min
October 23, 2002	10:57am	2:11pm	3 hr 14 min
November 20, 2002	----	-----	0 hr 0 min
December 18, 2002	----	-----	0 hr 0 min



## Sunrise and Sunset Data for **Mystery Location #2**

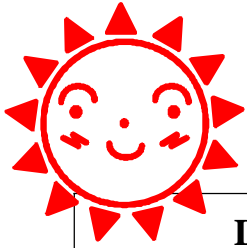


Date	Sunrise	Sunset	Daylight hours and minutes
January 16, 2002	10:55am	5:25pm	6 hr 30 min
February 13, 2002	9:47am	6:41pm	8 hr 54 min
March 13, 2002	8:23am	7:57pm	11 hr 34 min
April 10, 2002	6:54am	9:09pm	14 hr 15 min
May 8, 2002	5:31am	10:23pm	16 hr 52 min
June 5, 2002	4:30am	11:28pm	18 hr 58 min
July 3, 2002	4:30am	11:37pm	19 hr 7 min
July 31, 2002	5:29am	10:41pm	17 hr 12 min
August 28, 2002	6:41am	9:18pm	14 hr 37 min
September 25, 2002	7:51am	7:50pm	11 hr 59 min
October 23, 2002	9:03am	6:23pm	9 hr 20 min
November 20, 2002	10:19am	5:11pm	6 hr 52 min
December 18, 2002	11:12am	4:40pm	5 hr 28 min



## Sunrise and Sunset Data for **Mystery Location #3**

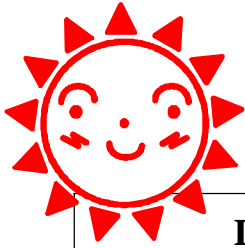
Date	Sunrise	Sunset	Daylight hours and minutes
January 16, 2002	5:49am	7:55pm	14 hr 6 min
February 13, 2002	6:17am	7:37pm	13 hr 20 min
March 13, 2002	6:41am	7:03pm	12 hr 22 min
April 10, 2002	7:01am	6:26pm	11 hr 25 min
May 8, 2002	7:22am	5:56pm	10 hr 34 min
June 5, 2002	7:40am	5:42pm	10 hr 2 min
July 3, 2002	7:47am	5:47pm	10 hr 0 min
July 31, 2002	7:35am	6:03pm	10 hr 28 min
August 28, 2002	7:06am	6:22pm	11 hr 16 min
September 25, 2002	6:28am	6:41pm	12 hr 13 min
October 23, 2002	5:52am	7:02pm	13 hr 10 min
November 20, 2002	5:29am	7:28pm	13 hr 59 min
December 18, 2002	5:28am	7:51pm	14 hr 23 min



## Sunrise and Sunset Data for **Mystery Location #4**



Date	Sunrise	Sunset	Daylight hours and minutes			
January 16, 2002	6:57am	7:03pm	12	hr	6	min
February 13, 2002	7:01am	7:08pm	12	hr	7	min
March 13, 2002	6:57am	7:03pm	12	hr	6	min
April 10, 2002	6:48am	6:55pm	12	hr	7	min
May 8, 2002	6:43am	6:51pm	12	hr	8	min
June 5, 2002	6:45am	6:53pm	12	hr	8	min
July 3, 2002	6:50am	6:59pm	12	hr	9	min
July 31, 2002	6:53am	7:01pm	12	hr	8	min
August 28, 2002	6:48am	6:55pm	12	hr	7	min
September 25, 2002	6:39am	6:45pm	12	hr	6	min
October 23, 2002	6:32am	6:38pm	12	hr	6	min
November 20, 2002	6:33am	6:39pm	12	hr	6	min
December 18, 2002	6:44am	6:50pm	12	hr	6	min



## Sunrise and Sunset Data for **Mystery Location #5**

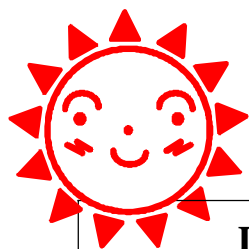


Date	Sunrise	Sunset	Daylight hours and minutes			
January 16, 2002	7:13am	7:16pm	12	hr	3	min
February 13, 2002	7:17am	7:21pm	12	hr	4	min
March 13, 2002	7:11am	7:17pm	12	hr	6	min
April 10, 2002	7:02am	7:10pm	12	hr	8	min
May 8, 2002	6:56am	7:06pm	12	hr	10	min
June 5, 2002	6:57am	7:09pm	12	hr	12	min
July 3, 2002	7:03am	7:15pm	12	hr	12	min
July 31, 2002	7:06am	7:17pm	12	hr	10	min
August 28, 2002	7:02am	7:10pm	12	hr	8	min
September 25, 2002	6:53am	7:00pm	12	hr	7	min
October 23, 2002	6:47am	6:51pm	12	hr	4	min
November 20, 2002	6:48am	6:52pm	12	hr	4	min
December 18, 2002	6:59am	7:03pm	12	hr	4	min



## Sunrise and Sunset Data for **Mystery Location #6**

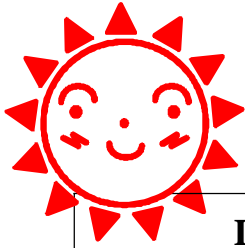
Date	Sunrise	Sunset	Daylight hours and minutes		
January 16, 2002	8:23am	6:09pm	9	hr	46 min
February 13, 2002	8:00am	6:41pm	10	hr	41 min
March 13, 2002	7:21am	7:11pm	11	hr	50 min
April 10, 2002	6:37am	7:38pm	13	hr	1 min
May 8, 2002	6:00am	8:05pm	14	hr	5 min
June 5, 2002	5:41am	8:28pm	14	hr	47 min
July 3, 2002	5:45am	8:35pm	14	hr	50 min
July 31, 2002	6:06am	8:19pm	14	hr	13 min
August 28, 2002	6:31am	7:43pm	13	hr	12 min
September 25, 2002	6:56am	6:58pm	12	hr	2 min
October 23, 2002	7:24am	6:16pm	10	hr	52 min
November 20, 2002	7:54am	5:49pm	9	hr	55 min
December 18, 2002	8:20am	5:46pm	9	hr	26 min



## Sunrise and Sunset Data for **Mystery Location #7**



Date	Sunrise	Sunset	Daylight hours and minutes		
January 16, 2002	----	-----	0	hr	0 min
February 13, 2002	11:22am	6:02pm	6	hr	40 min
March 13, 2002	8:59am	8:16pm	11	hr	17 min
April 10, 2002	6:38am	10:21pm	15	hr	43 min
May 8, 2002	3:32am	01:14am	21	hr	42 min
June 5, 2002	0:00am	0:00am	24	hr	0 min
July 3, 2002	0:00am	0:00am	24	hr	0 min
July 31, 2002	0:00am	0:00am	24	hr	0 min
August 28, 2002	6:16am	10:37pm	16	hr	21 min
September 25, 2002	8:20am	8:15pm	11	hr	55 min
October 23, 2002	10:27am	5:55pm	7	hr	28 min
November 20, 2002	----	-----	0	hr	0 min
December 18, 2002	----	-----	0	hr	0 min



## Sunrise and Sunset Data for **Mystery Location #8**



Date	Sunrise	Sunset	Daylight hours and minutes		
January 16, 2002	0:00am	0:00am	24	hr	0 min
February 13, 2002	3:33am	00:57am	21	hr	24 min
March 13, 2002	7:14am	9:02pm	13	hr	48 min
April 10, 2002	9:54am	6:06pm	8	hr	12 min
May 8, 2002	----	-----	0	hr	0 min
June 5, 2002	----	-----	0	hr	0 min
July 3, 2002	----	-----	0	hr	0 min
July 31, 2002	----	-----	0	hr	0 min
August 28, 2002	10:21am	5:43pm	7	hr	22 min
September 25, 2002	7:25am	8:22pm	12	hr	57 min
October 23, 2002	4:07am	11:29pm	19	hr	22 min
November 20, 2002	0:00am	0:00am	24	hr	0 min
December 18, 2002	0:00am	0:00am	24	hr	0 min

Anchorage, Alaska N61 13', W149 54'						
Week #	Mid Week Date	Amount of Daylight				
		Sun Rise	Sun Set	hours	minutes	Daylight Decimal Hrs
1	January 2, 2002	1113	1655	5	42	5.7
2	January 9, 2002	1106	1708	6	2	6.0
3	January 16, 2002	1055	1725	6	30	6.5
4	January 23, 2002	1041	1743	7	2	7.0
5	January 30, 2002	1025	1802	7	37	7.6
6	February 6, 2002	1007	1822	8	15	8.3
7	February 13, 2002	947	1841	8	54	8.9
8	February 20, 2002	927	1901	9	34	9.6
9	February 27, 2002	906	1920	10	14	10.2
10	March 6, 2002	845	1938	10	53	10.9
11	March 13, 2002	823	1957	11	34	11.6
12	March 20, 2002	801	2015	12	14	12.2
13	March 27, 2002	738	2033	12	55	12.9
14	April 3, 2002	716	2051	13	35	13.6
15	April 10, 2002	654	2109	14	15	14.3
16	April 17, 2002	632	2128	14	56	14.9
17	April 24, 2002	611	2146	15	35	15.6
18	May 1, 2002	550	2205	16	15	16.3
19	May 8, 2002	531	2223	16	52	16.9
20	May 15, 2002	512	2242	17	30	17.5
21	May 22, 2002	455	2259	18	4	18.1
22	May 29, 2002	441	2314	18	33	18.6
23	June 5, 2002	430	2328	18	58	19.0
24	June 12, 2002	422	2337	19	15	19.3
25	June 19, 2002	420	2342	19	22	19.4
26	June 26, 2002	423	2342	19	19	19.3
27	July 3, 2002	430	2337	19	7	19.1
28	July 10, 2002	441	2327	18	46	18.8
29	July 17, 2002	456	2314	18	18	18.3
30	July 24, 2002	512	2258	17	46	17.8
31	July 31, 2002	529	2241	17	12	17.2
32	August 7, 2002	548	2221	16	33	16.6
33	August 14, 2002	606	2201	15	55	15.9
34	August 21, 2002	624	2140	15	16	15.3
35	August 28, 2002	641	2118	14	37	14.6
36	September 4, 2002	659	2056	13	57	14.0
37	September 11, 2002	717	2034	13	17	13.3
38	September 18, 2002	734	2012	12	38	12.6
39	September 25, 2002	751	1950	11	59	12.0
40	October 2, 2002	809	1927	11	18	11.3
41	October 9, 2002	827	1906	10	39	10.7
42	October 16, 2002	845	1844	9	59	10.0
43	October 23, 2002	903	1823	9	20	9.3
44	October 30, 2002	922	1803	8	41	8.7
45	November 6, 2002	942	1744	8	2	8.0
46	November 13, 2002	1001	1726	7	25	7.4
47	November 20, 2002	1019	1711	6	52	6.9
48	November 27, 2002	1037	1658	6	21	6.4
49	December 4, 2002	1052	1648	5	56	5.9
50	December 11, 2002	1104	1642	5	38	5.6
51	December 18, 2002	1112	1640	5	28	5.5
52	December 25, 2002	1116	1644	5	28	5.5
Total Daylight for 52 data points in hours						646.4
Estimated Total Daylight per year in hours						4524.7

Santiago, Chile W070 40', S22 27'						
Week #	Mid Week Date			Amount of Daylight		Daylight Decimal Hrs
		Sun Rise	Sun Set	hours	minutes	
1	January 2, 2002	537	1956	14	19	14.3
2	January 9, 2002	543	1956	14	13	14.2
3	January 16, 2002	549	1955	14	6	14.1
4	January 23, 2002	556	1953	13	57	14.0
5	January 30, 2002	603	1948	13	45	13.8
6	February 6, 2002	610	1943	13	33	13.6
7	February 13, 2002	617	1937	13	20	13.3
8	February 20, 2002	623	1929	13	6	13.1
9	February 27, 2002	629	1921	12	52	12.9
10	March 6, 2002	635	1912	12	37	12.6
11	March 13, 2002	641	1903	12	22	12.4
12	March 20, 2002	646	1854	12	8	12.1
13	March 27, 2002	651	1845	11	54	11.9
14	April 3, 2002	656	1835	11	39	11.7
15	April 10, 2002	701	1826	11	25	11.4
16	April 17, 2002	706	1818	11	12	11.2
17	April 24, 2002	711	1810	10	59	11.0
18	May 1, 2002	717	1802	10	45	10.8
19	May 8, 2002	722	1756	10	34	10.6
20	May 15, 2002	727	1751	10	24	10.4
21	May 22, 2002	732	1747	10	15	10.3
22	May 29, 2002	736	1744	10	8	10.1
23	June 5, 2002	740	1742	10	2	10.0
24	June 12, 2002	744	1741	9	57	10.0
25	June 19, 2002	746	1742	9	56	9.9
26	June 26, 2002	747	1744	9	57	10.0
27	July 3, 2002	747	1747	10	0	10.0
28	July 10, 2002	746	1750	10	4	10.1
29	July 17, 2002	744	1754	10	10	10.2
30	July 24, 2002	740	1759	10	19	10.3
31	July 31, 2002	735	1803	10	28	10.5
32	August 7, 2002	729	1808	10	39	10.7
33	August 14, 2002	722	1813	10	51	10.9
34	August 21, 2002	714	1818	11	4	11.1
35	August 28, 2002	706	1822	11	16	11.3
36	September 4, 2002	657	1827	11	30	11.5
37	September 11, 2002	647	1832	11	45	11.8
38	September 18, 2002	638	1836	11	58	12.0
39	September 25, 2002	628	1841	12	13	12.2
40	October 2, 2002	619	1846	12	27	12.5
41	October 9, 2002	609	1851	12	42	12.7
42	October 16, 2002	601	1857	12	56	12.9
43	October 23, 2002	552	1902	13	10	13.2
44	October 30, 2002	545	1908	13	23	13.4
45	November 6, 2002	538	1915	13	37	13.6
46	November 13, 2002	533	1921	13	48	13.8
47	November 20, 2002	529	1928	13	59	14.0
48	November 27, 2002	527	1934	14	7	14.1
49	December 4, 2002	526	1940	14	14	14.2
50	December 11, 2002	526	1946	14	20	14.3
51	December 18, 2002	528	1951	14	23	14.4
52	December 25, 2002	532	1954	14	22	14.4

Total Daylight for 52 data points in hours 629.2

Estimated Total Daylight per year in hours 4404.2

Anchorage, Maryland N39 03', W076 30'						
Week #	Mid Week Date	Amount of Daylight				Daylight Decimal Hrs
		Sun Rise	Sun Set	hours	minutes	
1	January 2, 2002	825	1755	9	30	9.5
2	January 9, 2002	825	1802	9	37	9.6
3	January 16, 2002	823	1809	9	46	9.8
4	January 23, 2002	820	1817	9	57	10.0
5	January 30, 2002	814	1825	10	11	10.2
6	February 6, 2002	808	1833	10	25	10.4
7	February 13, 2002	800	1841	10	41	10.7
8	February 20, 2002	751	1849	10	58	11.0
9	February 27, 2002	742	1856	11	14	11.2
10	March 6, 2002	731	1904	11	33	11.6
11	March 13, 2002	721	1911	11	50	11.8
12	March 20, 2002	710	1918	12	8	12.1
13	March 27, 2002	659	1925	12	26	12.4
14	April 3, 2002	648	1932	12	44	12.7
15	April 10, 2002	637	1938	13	1	13.0
16	April 17, 2002	627	1945	13	18	13.3
17	April 24, 2002	617	1952	13	35	13.6
18	May 1, 2002	608	1959	13	51	13.9
19	May 8, 2002	600	2005	14	5	14.1
20	May 15, 2002	553	2012	14	19	14.3
21	May 22, 2002	548	2018	14	30	14.5
22	May 29, 2002	543	2024	14	41	14.7
23	June 5, 2002	541	2028	14	47	14.8
24	June 12, 2002	540	2032	14	52	14.9
25	June 19, 2002	540	2035	14	55	14.9
26	June 26, 2002	542	2036	14	54	14.9
27	July 3, 2002	545	2035	14	50	14.8
28	July 10, 2002	549	2033	14	44	14.7
29	July 17, 2002	554	2030	14	36	14.6
30	July 24, 2002	600	2025	14	25	14.4
31	July 31, 2002	606	2019	14	13	14.2
32	August 7, 2002	612	2011	13	59	14.0
33	August 14, 2002	618	2002	13	44	13.7
34	August 21, 2002	625	1953	13	28	13.5
35	August 28, 2002	631	1943	13	12	13.2
36	September 4, 2002	637	1932	12	55	12.9
37	September 11, 2002	644	1921	12	37	12.6
38	September 18, 2002	650	1910	12	20	12.3
39	September 25, 2002	656	1858	12	2	12.0
40	October 2, 2002	703	1847	11	44	11.7
41	October 9, 2002	710	1836	11	26	11.4
42	October 16, 2002	716	1826	11	10	11.2
43	October 23, 2002	724	1816	10	52	10.9
44	October 30, 2002	731	1808	10	37	10.6
45	November 6, 2002	739	1800	10	21	10.4
46	November 13, 2002	747	1754	10	7	10.1
47	November 20, 2002	754	1749	9	55	9.9
48	November 27, 2002	802	1745	9	43	9.7
49	December 4, 2002	809	1744	9	35	9.6
50	December 11, 2002	815	1744	9	29	9.5
51	December 18, 2002	820	1746	9	26	9.4
52	December 25, 2002	823	1749	9	26	9.4

Total Daylight for 52 data points in hours 634.7

Estimated Total Daylight per year in hours 4443.1

Kampala, Uganda N00 19', E032 25'						
Week #	Mid Week Date			Amount of Daylight		Daylight Decimal Hrs
		Sun Rise	Sun Set	hours	minutes	
1	January 2, 2002	651	1857	12	6	12.1
2	January 9, 2002	654	1901	12	7	12.1
3	January 16, 2002	657	1903	12	6	12.1
4	January 23, 2002	659	1905	12	6	12.1
5	January 30, 2002	700	1907	12	7	12.1
6	February 6, 2002	701	1908	12	7	12.1
7	February 13, 2002	701	1908	12	7	12.1
8	February 20, 2002	701	1907	12	6	12.1
9	February 27, 2002	700	1906	12	6	12.1
10	March 6, 2002	658	1905	12	7	12.1
11	March 13, 2002	657	1903	12	6	12.1
12	March 20, 2002	655	1901	12	6	12.1
13	March 27, 2002	652	1859	12	7	12.1
14	April 3, 2002	650	1857	12	7	12.1
15	April 10, 2002	648	1855	12	7	12.1
16	April 17, 2002	646	1853	12	7	12.1
17	April 24, 2002	645	1852	12	7	12.1
18	May 1, 2002	644	1851	12	7	12.1
19	May 8, 2002	643	1851	12	8	12.1
20	May 15, 2002	643	1851	12	8	12.1
21	May 22, 2002	643	1851	12	8	12.1
22	May 29, 2002	644	1852	12	8	12.1
23	June 5, 2002	645	1853	12	8	12.1
24	June 12, 2002	646	1854	12	8	12.1
25	June 19, 2002	647	1856	12	9	12.2
26	June 26, 2002	649	1857	12	8	12.1
27	July 3, 2002	650	1859	12	9	12.2
28	July 10, 2002	652	1900	12	8	12.1
29	July 17, 2002	652	1901	12	9	12.2
30	July 24, 2002	653	1901	12	8	12.1
31	July 31, 2002	653	1901	12	8	12.1
32	August 7, 2002	652	1900	12	8	12.1
33	August 14, 2002	651	1859	12	8	12.1
34	August 21, 2002	650	1857	12	7	12.1
35	August 28, 2002	648	1855	12	7	12.1
36	September 4, 2002	646	1853	12	7	12.1
37	September 11, 2002	644	1850	12	6	12.1
38	September 18, 2002	641	1848	12	7	12.1
39	September 25, 2002	639	1845	12	6	12.1
40	October 2, 2002	637	1843	12	6	12.1
41	October 9, 2002	635	1841	12	6	12.1
42	October 16, 2002	633	1839	12	6	12.1
43	October 23, 2002	632	1838	12	6	12.1
44	October 30, 2002	631	1837	12	6	12.1
45	November 6, 2002	631	1837	12	6	12.1
46	November 13, 2002	631	1838	12	7	12.1
47	November 20, 2002	633	1839	12	6	12.1
48	November 27, 2002	635	1841	12	6	12.1
49	December 4, 2002	637	1844	12	7	12.1
50	December 11, 2002	640	1847	12	7	12.1
51	December 18, 2002	644	1850	12	6	12.1
52	December 25, 2002	647	1853	12	6	12.1

Total Daylight for 52 data points in hours 630.1

Estimated Total Daylight per year in hours 4410.4

Barrow, Alaska N71 17', W156 47'						
Week #	Mid Week Date			Amount of Daylight		Daylight Decimal Hrs
		Sun Rise	Sun Set	hours	minutes	
1	January 2, 2002	0	0	0	0	0.0
2	January 9, 2002	0	0	0	0	0.0
3	January 16, 2002	0	0	0	0	0.0
4	January 23, 2002	1401	1518	1	17	1.3
5	January 30, 2002	1249	1633	3	44	3.7
6	February 6, 2002	1203	1721	5	18	5.3
7	February 13, 2002	1122	1802	6	40	6.7
8	February 20, 2002	1045	1838	7	53	7.9
9	February 27, 2002	1009	1912	9	3	9.1
10	March 6, 2002	934	1945	10	11	10.2
11	March 13, 2002	859	2016	11	17	11.3
12	March 20, 2002	825	2047	12	22	12.4
13	March 27, 2002	750	2117	13	27	13.5
14	April 3, 2002	715	2149	14	34	14.6
15	April 10, 2002	638	2221	15	43	15.7
16	April 17, 2002	601	2256	16	55	16.9
17	April 24, 2002	520	2335	18	15	18.3
18	May 1, 2002	434	0013	19	39	19.7
19	May 8, 2002	332	0114	21	42	21.7
20	May 15, 2002	0000	0000	24	0	24.0
21	May 22, 2002	0000	0000	24	0	24.0
22	May 29, 2002	0000	0000	24	0	24.0
23	June 5, 2002	0000	0000	24	0	24.0
24	June 12, 2002	0000	0000	24	0	24.0
25	June 19, 2002	0000	0000	24	0	24.0
26	June 26, 2002	0000	0000	24	0	24.0
27	July 3, 2002	0000	0000	24	0	24.0
28	July 10, 2002	0000	0000	24	0	24.0
29	July 17, 2002	0000	0000	24	0	24.0
30	July 24, 2002	0000	0000	24	0	24.0
31	July 31, 2002	0000	0000	24	0	24.0
32	August 7, 2002	408	0051	20	51	20.9
33	August 14, 2002	506	2352	18	46	18.8
34	August 21, 2002	540	2316	17	36	17.6
35	August 28, 2002	616	2237	16	21	16.4
36	September 4, 2002	649	2200	15	11	15.2
37	September 11, 2002	720	2125	14	5	14.1
38	September 18, 2002	750	2050	13	0	13.0
39	September 25, 2002	820	2015	11	55	11.9
40	October 2, 2002	850	1941	10	51	10.9
41	October 9, 2002	921	1906	9	45	9.8
42	October 16, 2002	953	1853	9	0	9.0
43	October 23, 2002	1027	1755	7	28	7.5
44	October 30, 2002	1103	1717	6	14	6.2
45	November 6, 2002	1145	1635	4	50	4.8
46	November 13, 2002	1237	1545	3	8	3.1
47	November 20, 2002	0	0	0	0	0.0
48	November 27, 2002	0	0	0	0	0.0
49	December 4, 2002	0	0	0	0	0.0
50	December 11, 2002	0	0	0	0	0.0
51	December 18, 2002	0	0	0	0	0.0
52	December 25, 2002	0	0	0	0	0.0

Total Daylight for 52 data points in hours 655.0

Estimated Total Daylight per year in hours 4585.1

Singapore, Republic of Singapore N01 16', E103 51'						
Week #	Mid Week Date			Amount of Daylight		Daylight Decimal Hrs
		Sun Rise	Sun Set	hours	minutes	
1	January 2, 2002	707	1910	12	3	12.1
2	January 9, 2002	710	1913	12	3	12.1
3	January 16, 2002	713	1916	12	3	12.1
4	January 23, 2002	715	1918	12	3	12.1
5	January 30, 2002	716	1920	12	4	12.1
6	February 6, 2002	717	1921	12	4	12.1
7	February 13, 2002	717	1921	12	4	12.1
8	February 20, 2002	716	1921	12	5	12.1
9	February 27, 2002	715	1920	12	5	12.1
10	March 6, 2002	713	1919	12	6	12.1
11	March 13, 2002	711	1917	12	6	12.1
12	March 20, 2002	709	1915	12	6	12.1
13	March 27, 2002	707	1914	12	7	12.1
14	April 3, 2002	705	1912	12	7	12.1
15	April 10, 2002	702	1910	12	8	12.1
16	April 17, 2002	700	1909	12	9	12.2
17	April 24, 2002	658	1907	12	9	12.2
18	May 1, 2002	657	1906	12	9	12.2
19	May 8, 2002	656	1906	12	10	12.2
20	May 15, 2002	656	1906	12	10	12.2
21	May 22, 2002	656	1907	12	11	12.2
22	May 29, 2002	656	1908	12	12	12.2
23	June 5, 2002	657	1909	12	12	12.2
24	June 12, 2002	659	1910	12	11	12.2
25	June 19, 2002	700	1912	12	12	12.2
26	June 26, 2002	701	1913	12	12	12.2
27	July 3, 2002	703	1915	12	12	12.2
28	July 10, 2002	704	1916	12	12	12.2
29	July 17, 2002	705	1916	12	11	12.2
30	July 24, 2002	706	1916	12	10	12.2
31	July 31, 2002	706	1916	12	10	12.2
32	August 7, 2002	705	1915	12	10	12.2
33	August 14, 2002	705	1914	12	9	12.2
34	August 21, 2002	703	1912	12	9	12.2
35	August 28, 2002	702	1910	12	8	12.1
36	September 4, 2002	700	1908	12	8	12.1
37	September 11, 2002	658	1905	12	7	12.1
38	September 18, 2002	655	1902	12	7	12.1
39	September 25, 2002	653	1900	12	7	12.1
40	October 2, 2002	651	1857	12	6	12.1
41	October 9, 2002	649	1855	12	6	12.1
42	October 16, 2002	648	1853	12	5	12.1
43	October 23, 2002	647	1851	12	4	12.1
44	October 30, 2002	646	1850	12	4	12.1
45	November 6, 2002	646	1850	12	4	12.1
46	November 13, 2002	647	1851	12	4	12.1
47	November 20, 2002	648	1852	12	4	12.1
48	November 27, 2002	650	1854	12	4	12.1
49	December 4, 2002	653	1856	12	3	12.1
50	December 11, 2002	656	1859	12	3	12.1
51	December 18, 2002	659	1903	12	4	12.1
52	December 25, 2002	703	1906	12	3	12.1

Total Daylight for 52 data points in hours 630.1

Estimated Total Daylight per year in hours 4410.6

Etah, Greenland N78 19', W72 38'						
Week #	Mid Week Date			Amount of Daylight		Daylight Decimal Hrs
		Sun Rise	Sun Set	hours	minutes	
1	January 2, 2002	0	0	0	0	0.0
2	January 9, 2002	0	0	0	0	0.0
3	January 16, 2002	0	0	0	0	0.0
4	January 23, 2002	0	0	0	0	0.0
5	January 30, 2002	0	0	0	0	0.0
6	February 6, 2002	0	0	0	0	0.0
7	February 13, 2002	0	0	0	0	0.0
8	February 20, 2002	1058	1513	4	15	4.3
9	February 27, 2002	940	1629	6	49	6.8
10	March 6, 2002	837	1730	8	53	8.9
11	March 13, 2002	740	1824	10	44	10.7
12	March 20, 2002	644	1916	12	32	12.5
13	March 27, 2002	548	2008	14	20	14.3
14	April 3, 2002	506	2048	15	42	15.7
15	April 10, 2002	339	2213	18	34	18.6
16	April 17, 2002	153	2400	22	7	22.1
17	April 24, 2002	0	2400	24	0	24.0
18	May 1, 2002	0	2400	24	0	24.0
19	May 8, 2002	0	2400	24	0	24.0
20	May 15, 2002	0	2400	24	0	24.0
21	May 22, 2002	0	2400	24	0	24.0
22	May 29, 2002	0	2400	24	0	24.0
23	June 5, 2002	0	2400	24	0	24.0
24	June 12, 2002	0	2400	24	0	24.0
25	June 19, 2002	0	2400	24	0	24.0
26	June 26, 2002	0	2400	24	0	24.0
27	July 3, 2002	0	2400	24	0	24.0
28	July 10, 2002	0	2400	24	0	24.0
29	July 17, 2002	0	2400	24	0	24.0
30	July 24, 2002	0	2400	24	0	24.0
31	July 31, 2002	0	2400	24	0	24.0
32	August 7, 2002	0	2400	24	0	24.0
33	August 14, 2002	0	2400	24	0	24.0
34	August 21, 2002	0	2400	24	0	24.0
35	August 28, 2002	233	2257	20	24	20.4
36	September 4, 2002	357	2135	17	38	17.6
37	September 11, 2002	458	2031	15	33	15.6
38	September 18, 2002	552	1933	13	41	13.7
39	September 25, 2002	646	1834	11	48	11.8
40	October 2, 2002	734	1743	10	9	10.2
41	October 9, 2002	828	1645	8	17	8.3
42	October 16, 2002	930	1539	6	9	6.2
43	October 23, 2002	1057	1411	3	14	3.2
44	October 30, 2002	0	0	0	0	0.0
45	November 6, 2002	0	0	0	0	0.0
46	November 13, 2002	0	0	0	0	0.0
47	November 20, 2002	0	0	0	0	0.0
48	November 27, 2002	0	0	0	0	0.0
49	December 4, 2002	0	0	0	0	0.0
50	December 11, 2002	0	0	0	0	0.0
51	December 18, 2002	0	0	0	0	0.0
52	December 25, 2002	0	0	0	0	0.0

Total Daylight for 52 data points in hours 652.8

Estimated Total Daylight per year in hours 4569.7

Baltimore, Maryland N39 19', W76 37'						
Week #	Mid Week Date			Amount of Daylight		Daylight Decimal Hrs
		Sun Rise	Sun Set	hours	minutes	
1	January 2, 2002	726	1655	9	29	9.5
2	January 9, 2002	726	1701	9	35	9.6
3	January 16, 2002	724	1709	9	45	9.8
4	January 23, 2002	721	1716	9	55	9.9
5	January 30, 2002	715	1725	10	10	10.2
6	February 6, 2002	709	1733	10	24	10.4
7	February 13, 2002	701	1741	10	40	10.7
8	February 20, 2002	652	1749	10	57	11.0
9	February 27, 2002	642	1757	11	15	11.3
10	March 6, 2002	632	1804	11	32	11.5
11	March 13, 2002	621	1811	11	50	11.8
12	March 20, 2002	610	1818	12	8	12.1
13	March 27, 2002	559	1825	12	26	12.4
14	April 3, 2002	548	1832	12	44	12.7
15	April 10, 2002	537	1839	13	2	13.0
16	April 17, 2002	527	1846	13	19	13.3
17	April 24, 2002	517	1853	13	36	13.6
18	May 1, 2002	508	1900	13	52	13.9
19	May 8, 2002	500	1906	14	6	14.1
20	May 15, 2002	453	1913	14	20	14.3
21	May 22, 2002	447	1919	14	32	14.5
22	May 29, 2002	443	1925	14	42	14.7
23	June 5, 2002	440	1930	14	50	14.8
24	June 12, 2002	439	1933	14	54	14.9
25	June 19, 2002	440	1936	14	56	14.9
26	June 26, 2002	441	1937	14	56	14.9
27	July 3, 2002	445	1937	14	52	14.9
28	July 10, 2002	449	1935	14	46	14.8
29	July 17, 2002	454	1931	14	37	14.6
30	July 24, 2002	459	1926	14	27	14.5
31	July 31, 2002	505	1920	14	15	14.3
32	August 7, 2002	512	1912	14	0	14.0
33	August 14, 2002	518	1903	13	45	13.8
34	August 21, 2002	525	1854	13	29	13.5
35	August 28, 2002	531	1844	13	13	13.2
36	September 4, 2002	538	1833	12	55	12.9
37	September 11, 2002	544	1822	12	38	12.6
38	September 18, 2002	550	1810	12	20	12.3
39	September 25, 2002	557	1759	12	2	12.0
40	October 2, 2002	603	1748	11	45	11.8
41	October 9, 2002	610	1737	11	27	11.5
42	October 16, 2002	617	1726	11	9	11.2
43	October 23, 2002	625	1717	10	52	10.9
44	October 30, 2002	632	1708	10	36	10.6
45	November 6, 2002	640	1700	10	20	10.3
46	November 13, 2002	648	1653	10	5	10.1
47	November 20, 2002	656	1648	9	52	9.9
48	November 27, 2002	703	1645	9	42	9.7
49	December 4, 2002	710	1643	9	33	9.6
50	December 11, 2002	716	1643	9	27	9.5
51	December 18, 2002	721	1645	9	24	9.4
52	December 25, 2002	724	1649	9	25	9.4

Total Daylight for 52 data points in hours 634.9

Estimated Total Daylight per year in hours 4444.0

Washington, DC N38 53', W77 02'						
Week #	Mid Week Date			Amount of Daylight		Daylight Decimal Hrs
		Sun Rise	Sun Set	hours	minutes	
1	January 2, 2002	727	1658	9	31	9.5
2	January 9, 2002	727	1704	9	37	9.6
3	January 16, 2002	725	1711	9	46	9.8
4	January 23, 2002	721	1719	9	58	10.0
5	January 30, 2002	716	1727	10	11	10.2
6	February 6, 2002	710	1735	10	25	10.4
7	February 13, 2002	702	1743	10	41	10.7
8	February 20, 2002	653	1751	10	58	11.0
9	February 27, 2002	644	1759	11	15	11.3
10	March 6, 2002	633	1806	11	33	11.6
11	March 13, 2002	623	1813	11	50	11.8
12	March 20, 2002	612	1820	12	8	12.1
13	March 27, 2002	601	1827	12	26	12.4
14	April 3, 2002	550	1834	12	44	12.7
15	April 10, 2002	539	1840	13	1	13.0
16	April 17, 2002	529	1847	13	18	13.3
17	April 24, 2002	519	1854	13	35	13.6
18	May 1, 2002	510	1901	13	51	13.9
19	May 8, 2002	503	1907	14	4	14.1
20	May 15, 2002	456	1914	14	18	14.3
21	May 22, 2002	450	1920	14	30	14.5
22	May 29, 2002	446	1925	14	39	14.7
23	June 5, 2002	443	1930	14	47	14.8
24	June 12, 2002	442	1934	14	52	14.9
25	June 19, 2002	443	1936	14	53	14.9
26	June 26, 2002	444	1937	14	53	14.9
27	July 3, 2002	447	1937	14	50	14.8
28	July 10, 2002	452	1935	14	43	14.7
29	July 17, 2002	457	1932	14	35	14.6
30	July 24, 2002	502	1927	14	25	14.4
31	July 31, 2002	508	1920	14	12	14.2
32	August 7, 2002	514	1913	13	59	14.0
33	August 14, 2002	521	1904	13	43	13.7
34	August 21, 2002	527	1855	13	28	13.5
35	August 28, 2002	533	1845	13	12	13.2
36	September 4, 2002	540	1834	12	54	12.9
37	September 11, 2002	546	1823	12	37	12.6
38	September 18, 2002	552	1812	12	20	12.3
39	September 25, 2002	558	1800	12	2	12.0
40	October 2, 2002	605	1749	11	44	11.7
41	October 9, 2002	612	1739	11	27	11.5
42	October 16, 2002	618	1728	11	10	11.2
43	October 23, 2002	626	1719	10	53	10.9
44	October 30, 2002	633	1710	10	37	10.6
45	November 6, 2002	641	1702	10	21	10.4
46	November 13, 2002	648	1656	10	8	10.1
47	November 20, 2002	656	1651	9	55	9.9
48	November 27, 2002	704	1648	9	44	9.7
49	December 4, 2002	710	1646	9	36	9.6
50	December 11, 2002	716	1646	9	30	9.5
51	December 18, 2002	721	1648	9	27	9.5
52	December 25, 2002	725	1652	9	27	9.5

Total Daylight for 52 data points in hours 634.7

Estimated Total Daylight per year in hours 4443.0

King Edward VII Land, Antarctica S75 00', W150 00'						
Week #	Mid Week Date	Amount of Daylight				Daylight Decimal Hrs
		Sun Rise	Sun Set	hours	minutes	
1	January 2, 2002	0	2400	24	0	24.0
2	January 9, 2002	0	2400	24	0	24.0
3	January 16, 2002	0	2400	24	0	24.0
4	January 23, 2002	0	2400	24	0	24.0
5	January 30, 2002	0	2400	24	0	24.0
6	February 6, 2002	0	2400	24	0	24.0
7	February 13, 2002	333	0057	21	24	21.4
8	February 20, 2002	451	2330	18	39	18.7
9	February 27, 2002	545	2235	16	50	16.8
10	March 6, 2002	632	2147	15	15	15.3
11	March 13, 2002	714	2102	13	48	13.8
12	March 20, 2002	754	2018	12	24	12.4
13	March 27, 2002	833	1935	11	2	11.0
14	April 3, 2002	913	1851	9	38	9.6
15	April 10, 2002	954	1806	8	12	8.2
16	April 17, 2002	1039	1718	6	39	6.7
17	April 24, 2002	1132	1622	4	50	4.8
18	May 1, 2002	1250	1503	2	13	2.2
19	May 8, 2002	0	0	0	0	0.0
20	May 15, 2002	0	0	0	0	0.0
21	May 22, 2002	0	0	0	0	0.0
22	May 29, 2002	0	0	0	0	0.0
23	June 5, 2002	0	0	0	0	0.0
24	June 12, 2002	0	0	0	0	0.0
25	June 19, 2002	0	0	0	0	0.0
26	June 26, 2002	0	0	0	0	0.0
27	July 3, 2002	0	0	0	0	0.0
28	July 10, 2002	0	0	0	0	0.0
29	July 17, 2002	0	0	0	0	0.0
30	July 24, 2002	0	0	0	0	0.0
31	July 31, 2002	0	0	0	0	0.0
32	August 7, 2002	0	0	0	0	0.0
33	August 14, 2002	1215	1556	3	41	3.7
34	August 21, 2002	1112	1656	5	44	5.7
35	August 28, 2002	1021	1743	7	22	7.4
36	September 4, 2002	935	1825	8	50	8.8
37	September 11, 2002	851	1905	10	14	10.2
38	September 18, 2002	808	1943	11	35	11.6
39	September 25, 2002	725	2022	12	57	13.0
40	October 2, 2002	641	2101	14	20	14.3
41	October 9, 2002	555	2144	15	49	15.8
42	October 16, 2002	505	2231	17	26	17.4
43	October 23, 2002	407	2329	19	22	19.4
44	October 30, 2002	236	0050	22	14	22.2
45	November 6, 2002	0	2400	24	0	24.0
46	November 13, 2002	0	2400	24	0	24.0
47	November 20, 2002	0	2400	24	0	24.0
48	November 27, 2002	0	2400	24	0	24.0
49	December 4, 2002	0	2400	24	0	24.0
50	December 11, 2002	0	2400	24	0	24.0
51	December 18, 2002	0	2400	24	0	24.0
52	December 25, 2002	0	2400	24	0	24.0

Total Daylight for 52 data points in hours 626.5

Estimated Total Daylight per year in hours 4385.3

Week #	Mid Week Date	Daylight hours King Edward VII Land, Antarctica	Daylight hours Kampala, Uganda	Daylight hours Santiago, Chile	Daylight hours Washington, DC	Daylight hours Etah, Greenland
	Date					
1	January 2, 2002	24.0	12.1	14.3	9.5	0.0
2	January 9, 2002	24.0	12.1	14.2	9.6	0.0
3	January 16, 2002	24.0	12.1	14.1	9.8	0.0
4	January 23, 2002	24.0	12.1	14.0	10.0	0.0
5	January 30, 2002	24.0	12.1	13.8	10.2	0.0
6	February 6, 2002	24.0	12.1	13.6	10.4	0.0
7	February 13, 2002	21.4	12.1	13.3	10.7	0.0
8	February 20, 2002	18.7	12.1	13.1	11.0	4.3
9	February 27, 2002	16.8	12.1	12.9	11.3	6.8
10	March 6, 2002	15.3	12.1	12.6	11.6	8.9
11	March 13, 2002	13.8	12.1	12.4	11.8	10.7
12	March 20, 2002	12.4	12.1	12.1	12.1	12.5
13	March 27, 2002	11.0	12.1	11.9	12.4	14.3
14	April 3, 2002	9.6	12.1	11.7	12.7	15.7
15	April 10, 2002	8.2	12.1	11.4	13.0	18.6
16	April 17, 2002	6.7	12.1	11.2	13.3	22.1
17	April 24, 2002	4.8	12.1	11.0	13.6	24.0
18	May 1, 2002	2.2	12.1	10.8	13.9	24.0
19	May 8, 2002	0.0	12.1	10.6	14.1	24.0
20	May 15, 2002	0.0	12.1	10.4	14.3	24.0
21	May 22, 2002	0.0	12.1	10.3	14.5	24.0
22	May 29, 2002	0.0	12.1	10.1	14.7	24.0
23	June 5, 2002	0.0	12.1	10.0	14.8	24.0
24	June 12, 2002	0.0	12.1	10.0	14.9	24.0
25	June 19, 2002	0.0	12.2	9.9	14.9	24.0
26	June 26, 2002	0.0	12.1	10.0	14.9	24.0
27	July 3, 2002	0.0	12.2	10.0	14.8	24.0
28	July 10, 2002	0.0	12.1	10.1	14.7	24.0
29	July 17, 2002	0.0	12.2	10.2	14.6	24.0
30	July 24, 2002	0.0	12.1	10.3	14.4	24.0
31	July 31, 2002	0.0	12.1	10.5	14.2	24.0
32	August 7, 2002	0.0	12.1	10.7	14.0	24.0
33	August 14, 2002	3.7	12.1	10.9	13.7	24.0
34	August 21, 2002	5.7	12.1	11.1	13.5	24.0
35	August 28, 2002	7.4	12.1	11.3	13.2	20.4
36	September 4, 2002	8.8	12.1	11.5	12.9	17.6
37	September 11, 2002	10.2	12.1	11.8	12.6	15.6
38	September 18, 2002	11.6	12.1	12.0	12.3	13.7
39	September 25, 2002	13.0	12.1	12.2	12.0	11.8
40	October 2, 2002	14.3	12.1	12.5	11.7	10.2
41	October 9, 2002	15.8	12.1	12.7	11.5	8.3
42	October 16, 2002	17.4	12.1	12.9	11.2	6.2
43	October 23, 2002	19.4	12.1	13.2	10.9	3.2
44	October 30, 2002	22.2	12.1	13.4	10.6	0.0
45	November 6, 2002	24.0	12.1	13.6	10.4	0.0
46	November 13, 2002	24.0	12.1	13.8	10.1	0.0
47	November 20, 2002	24.0	12.1	14.0	9.9	0.0
48	November 27, 2002	24.0	12.1	14.1	9.7	0.0
49	December 4, 2002	24.0	12.1	14.2	9.6	0.0
50	December 11, 2002	24.0	12.1	14.3	9.5	0.0
51	December 18, 2002	24.0	12.1	14.4	9.5	0.0
52	December 25, 2002	24.0	12.1	14.4	9.5	0.0
		626.5 4385.3	630.1 4410.4	629.2 4404.2	634.7 4443.0	652.8 4569.7

# Comparing Daylight Hours

Teacher Resource Sheet #16

